pivoting the swingarm through ~~the range~~ of motion while maintaining a substantially ~~constant~~ belt path ~~length defined~~ by the drive sprocket, the wheel sprocket, and the tensioner.

REMARKS

Applicants amend independent claims 1 and 9, and claims 1-15 are pending in this application. Applicants respectfully request allowance of all the pending claims.

The Examiner rejects claims 1-4, 6, and 8 under 35 U.S.C. §102(b) as being anticipated by French Patent No. 2520321 ("Guichard"). The Examiner rejects claim 5 under 35 U.S.C. §103(a) as being unpatentable over Guichard in view of United States Patent No. 4,828,069 ("Hatsuyama"), and the Examiner rejects claim 7 under 35 U.S.C. §103(a) as being unpatentable over Guichard in view of French Patent No. 1020216 ("Bernard").

Claim 1 recites a motorcycle including a frame and an engine/transmission assembly mounted to said frame and having an output shaft rotating in response to the operation of the engine/transmission assembly. A drive sprocket is mounted to the output shaft for rotation with the output shaft. A swingarm is pivotably mounted to the frame or the engine/transmission assembly for pivotal movement within a range of motion. A rear wheel is mounted to the swingarm for rotation, and a wheel sprocket is mounted to the rear wheel for rotation with the rear wheel. A flexible drive member couples the drive sprocket and the wheel sprocket such that the rear wheel is caused to rotate in response to the operation of the engine/transmission assembly. The flexible drive member includes an upper extent extending between the upper portions of the drive sprocket and the wheel sprocket, and a lower extent extending between the lower portions of the drive sprocket and the wheel sprocket. A tensioner contacts the lower extent and is fixed to the frame or the engine/transmission assembly against both pivotal and translational movement with respect to the output shaft. The drive sprocket, the wheel sprocket, and the tensioner are sized and positioned such that a belt path length defined by the drive sprocket, the rear sprocket, and the tensioner remains substantially constant as the swingarm pivots through the range of motion.

For the Examiner's convenience, Applicants enclose an English language translation of F.'321 Guichard in Appendix B. Guichard discloses a motorcycle having a frame (2) and an engine (1) coupled to the frame (2) (Fig. 2). The motorcycle includes a swing arm (4) pivotally connected

to the frame (2), and a rear wheel (3) rotatably connected to the swing arm (4). The rear suspension (6) is connected between the frame (2) and the rear wheel (3), and the rear suspension (6) lengthens and contracts in response to forces applied to the wheel (3). A belt (9) couples a engine sprocket (7) with a rear wheel sprocket (8), and a sprocket wheel (10) is connected to the frame (2) and contacts the upper, taut extent of the belt (9). The sprocket wheel (10) is positioned against the upper portion of the belt to reduce the compression or extension of the suspension when engine power is applied to the rear wheel sprocket (8) (See Translation, p. 3, para. 5). This effect of the acceleration on the suspension (6) is disadvantageous because it shortens the available stroke of the suspension (6), thereby creating a more rigid suspension and a less comfortable ride. (See Translation, p. 1, para. 4).

Guichard does not teach or suggest a tensioner that contacts the lower extent of the belt. Guichard does not teach or suggest anything at all in contact with the lower extent of the belt. Rather, Guichard merely discloses a sprocket wheel (10) in contact with the upper extent of the belt.

In addition, Guichard does not teach or suggest a tensioner sized and positioned such that a belt path length defined by the drive sprocket, the rear sprocket, and the tensioner remains substantially constant as the swingarm pivots through its range of motion. The sprocket wheel (10) disclosed in Guichard serves a completely different function than the claimed tensioner. The sprocket wheel (10) is positioned to contact the upper extent of the belt (9) to reduce the effect of the acceleration on the suspension (6) throughout the range of motion of the pivot arm (4), whereas the claimed tensioner is positioned to contact the lower portion of the belt to maintain a constant belt path length throughout the range of motion of the swingarm (i.e., to eliminate stretch and slack from the belt as the swingarm pivots throughout its range of motion).

Therefore, for the reasons stated above, Guichard does not teach or suggest the subject matter defined by independent claim 1. Accordingly, independent claim 1 is allowable. Claims 2-8 depend from allowable independent claim 1 and are allowable for the same and other reasons.

The Examiner rejects claims 9, 10, 12, 14, and 15 under 35 U.S.C. §102(b) as being anticipated by Guichard. The Examiner rejects claim 11 under 35 U.S.C. §103(a) as being unpatentable over Guichard in view of Hatsuyama, and the Examiner rejects claim 13 under 35 U.S.C. §103(a) as being unpatentable over Guichard in view of Bernard.

Claim 9 recites a method for tensioning a motorcycle flexible drive member. The method including providing a motorcycle frame and a swingarm, mounting an engine/transmission assembly to the motorcycle frame, the engine/transmission assembly having an output shaft rotating about an axis of rotation in response to operation of the engine/transmission assembly, mounting a drive sprocket to the output shaft for rotation therewith, mounting a rear wheel to the swingarm for rotation with respect to the swingarm, mounting a wheel sprocket to the rear wheel for rotation therewith, pivotably interconnecting the swingarm with at least one of the frame and engine/transmission assembly to permit pivotable movement of the swingarm in a range of motion about a pivot axis that is non-collinear with the axis of rotation of the output shaft, coupling the drive sprocket and the wheel sprocket with a flexible drive member such that the rear wheel rotates in response to rotation of the output shaft, mounting a tensioner to at least one of the engine/transmission assembly and frame such that the tensioner applies tension to a lower extent of the drive member, fixing the tensioner against translational and pivotable movement with respect to the engine/transmission assembly and frame, and pivoting the swingarm through the range of motion while maintaining a substantially constant belt path length defined by the drive sprocket, the wheel sprocket, and the tensioner.

The arguments presented above with respect to independent claim 1 apply with equal weight to independent claim 9. Specifically, Guichard does not teach or suggest a tensioner that contacts the lower extent of the belt, and Guichard does not teach or suggest a tensioner sized and positioned such that a belt path length defined by the drive sprocket, the rear sprocket, and the tensioner remains substantially constant as the swingarm pivots through its range of motion.

Therefore, for the reasons stated above, Guichard does not teach or suggest the subject matter defined by independent claim 9. Accordingly, independent claim 9 is allowable. Claims 9-15 depend from allowable independent claim 9 and are allowable for the same and other reasons.

The Examiner is invited to contact the undersigned attorney should the Examiner determine that such action would facilitate the prosecution and allowance of the present application.

Respectfully submitted,

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APPENDIX A

1. (Amended) A motorcycle comprising:

a frame;

an engine/transmission assembly mounted to said frame and having an output shaft rotating in response to operation of said engine/transmission assembly;

a drive sprocket mounted to said output shaft for rotation therewith;

a swingarm pivotably mounted to at least one of said frame and engine/transmission assembly for pivotal movement within a range of motion;

a rear wheel mounted to said swingarm for rotation with respect to said swingarm;

a wheel sprocket mounted to said rear wheel for rotation therewith;

a flexible drive member coupling said drive sprocket and said wheel sprocket such that said rear wheel is caused to rotate in response to operation of said engine/transmission assembly, wherein said flexible drive member includes an upper extent extending between the upper portions of said drive sprocket and said wheel sprocket, and a lower extent extending between the lower portions of said drive sprocket and said wheel sprocket; and

a tensioner fixed to at least one of said frame and engine/transmission assembly against both pivotal and translational movement with respect to said output shaft, wherein said tensioner contacts the lower extent, and wherein said drive sprocket, said wheel sprocket, and said tensioner are sized and positioned such that a belt path length defined by said drive sprocket, said rear sprocket, and said tensioner remains substantially constant as said swingarm pivots through said range of motion.

9. (Amended) A method for tensioning a motorcycle flexible drive member, the method comprising:

providing a motorcycle frame and a swingarm;

mounting an engine/transmission assembly to the motorcycle frame, the engine/transmission assembly having an output shaft rotating about an axis of rotation in response to operation of the engine/transmission assembly;

mounting a drive sprocket to the output shaft for rotation therewith;

mounting a rear wheel to the swingarm for rotation with respect to the swingarm;

mounting a wheel sprocket to the rear wheel for rotation therewith;

pivotably interconnecting the swingarm with at least one of the frame and engine/transmission assembly to permit pivotable movement of the swingarm in a range of motion about a pivot axis that is non-collinear with the axis of rotation of the output shaft;

coupling the drive sprocket and the wheel sprocket with a flexible drive member such that the rear wheel rotates in response to rotation of the output shaft;

mounting a tensioner to at least one of the engine/transmission assembly and frame such that the tensioner applies tension to <u>a lower extent of</u> the drive member;

fixing the tensioner against translational and pivotable movement with respect to the engine/transmission assembly and frame; and

pivoting the swingarm through the range of motion while maintaining a substantially constant belt path length defined by the drive sprocket, the wheel sprocket, and the tensioner.

APPENDIX B

This invention concerns motorcycles equipped with a rear suspension and in which the engine power is transferred to rear wheel by means of a chain or belt. It also concerns bicycles equipped with a rear suspension.

The rear suspension system used almost universally on motorcycles, and known by the name swing arm suspension, composed essentially of forked arm supporting the axis of the rear wheel and the front of which pivots on an axis parallel to the axis of the rear wheel. The mounting of the rear wheel on a swing arm works to allow this sprocket wheel to travel in relation to the part of the motorcycle supported by the suspension. This travel is controlled by one or more springs, most often associated with a hydraulic suspension system, mounted (directly or through a system of levers) between the swing arm and the part of the motorcycle supported by the suspension.

For practical reasons, related to simplicity of construction and reduction of lateral bulk, the swing arm axis is general not concentric to the engine gear axis (which would allow it to maintain a constant center distance between the engine gear and the countershaft gear as the suspension travels), but is located behind it. Furthermore, in order to minimize variations in the center distance between the two gears, the hinge pin of the swing arm is normally not far from the plane passing through the engine gear axis and the rear wheel axis when the suspension is at the mid point of its range of travel.

The various forces brought into play by the transfer of the engine power (reaction of the tire on the ground, traction exerted by the chain) exert an action on the swing arm, in direct proportion to the power transferred and depending on the relative position of the various components of the transmission and rear suspension; this action is superimposed on the action of the springs and shock absorbers responsible for controlling the travel of the suspension and, depending on the case, compresses or releases the suspension, unnecessarily shortening the stroke available in the direction in question.

Furthermore, variations in the momentum of these forces, in relation to the hinge pin of the swing arm, depending on the travel of the suspension, result in rigidity which, superimposed on that of the suspension springs, interferes with the operation of the latter.
The lighter and more powerful the motorcycle is, the more significant this interference is.

The invention proposes to reduce and even practically eliminate these drawbacks. To do this, on a motorcycle according to the invention, the taut portion of the chain (i.e., the part of the chain that transfers the power from the engine gear to the countershaft gear) rests on a sprocket wheel that turns freely on an axis forming an integral part of the part of the motorcycle supported by the suspension.

This has the effect of introducing an additional force between the swing arm and the suspended part, in proportion to the traction force transferred by the chain, and depending on the suspension compression. The calculation shows that, by choosing the appropriate position for the sprocket wheel, the effects of this force offset the detrimental effects described above and can even almost completely eliminate them over a large part of the suspensions range of travel. Depending on the application, the priority will be to eliminate the effect of the interfering force or the effect of the interfering rigidity.

The position chosen for the sprocket wheel may keep the chain from coming in contact with the sprocket wheel for part of the range of travel of the suspension. In this case, the detrimental interactions between the transmission and the suspension are reduced only for the part of the range of travel during which the chain is in contact with the sprocket wheel. This may be acceptable if the range of travel of the suspension for which the system is inoperative corresponds to conditions under which the motorcycle is seldom used. However, it is then possible to use a variation of the invention that uses a second sprocket wheel, with the two sprocket wheels located on either side of the taut portion of the chain.

In some cases, particularly when the suspension has a large range of travel, the reaction sprocket wheel may not offset the interference as precisely as one would wish over the entire range of travel of the suspension. In such a case, even more sprocket wheels may be provided for on one side or the other or on both sides of the taught portion, being activated one after the other depending on the suspension's range of movement.

Figure 1 shows an example of a motorcycle rear suspension and transmission representative of the known system normally encountered. The other figures represent various embodiments according to the invention.

In the known system represented by figure 1, the engine-drive unit 1, combining the engine and, if applicable, the clutch and the gearbox, is mounted in the frame 2. These two subassemblies 1 and 2 belong to what is called the part of the motorcycle supported by the suspension. In relation to this suspended part, the wheel 3 is able move in a plane perpendicular to the direction of its axis of rotation by virtue of being mounted on a swing arm 4; this swing arm is connected to the suspended part by a hinge pin 5 (parallel to the sprocket wheel's axis of rotation) and by a system of springs and hydraulic shock absorbers 6.

The engine power is transferred to the rear wheel using an engine gear 7 and countershaft gear 8. These two gears are connected by a chain 9. It should be noted that, when engine power is transferred to the rear wheel, it is transferred only by the part of the chain located over the plane passing through the axis of rotation of the engine gear and the axis of rotation of the rear wheel. This part of the chain is called the taut portion.

Figure 2 represents an embodiment according to the invention. In comparison with the known system in figure 1, it is characterized by the existence of a sprocket wheel 10, the axis of which is attached to the part of the motorcycle supported by the suspension (in this case, the frame 2), and on which the taut portion of the chain rests, with this sprocket wheel rotating freely around its axis.

The existence of tension T, resulting from the transfer of the engine power, in the taut portion of the chain, associated with the change in direction imposed on it by the sprocket wheel, causes the chains to transfer a force F to the sprocket wheel axis (and therefore to the part of the motorcycle supported by the suspension); this force F is proportional to the power transferred by the chain and depends on the compression of the suspension.

The position of the sprocket wheel 10 is calculated, depending on the various parameters of the motorcycle, in such a way that the force F reduces (and, if possible, eliminates) the suspension's tendency to be compressed or released when engine power is applied and so that variations in force F based on the travel of the suspension reduce (and, if possible, neutralize) the effect of the interfering rigidity normally seen in these known systems.

Figure 3 represents another embodiment according to the invention. It is distinguished from the embodiment represented in Figure 2 by the existence of a second reaction sprocket wheel 11, which also turns on an axis that forms an integral part of the frame. This second sprocket wheel is activated for traveling of the suspension for which the taut portion of the chain cannot exert pressure against the sprocket wheel 10.

Figure 4 represents a third embodiment according to the invention. It is distinguished from the embodiment in Figure 2 by the presence of a sprocket wheel 12 that is activated only for large movements of the suspension.

Figure 5 represents an embodiment of the invention involving several sprocket wheels.

The invention may be applied to any motorcycle equipped with chain transmission equipped with rear suspension. It may also be used when the chain is replaced by a belt.

Although the invention has been described on a motorcycle with a swing arm rear suspension, it may also be used on any motorcycle with chain or belt transmission equipped with any other known suspension steering system (sliding suspension, for example).

Finally, the invention may find an application in the production of bicycles with rear suspension (in this case, the engine power is supplied by the pedaling of the cyclist), regardless of the mode of guiding the rear suspension, for which it helps keep the pedal power, which varies considerably during a pedal rotation, from resulting in constant pumping of the suspension.

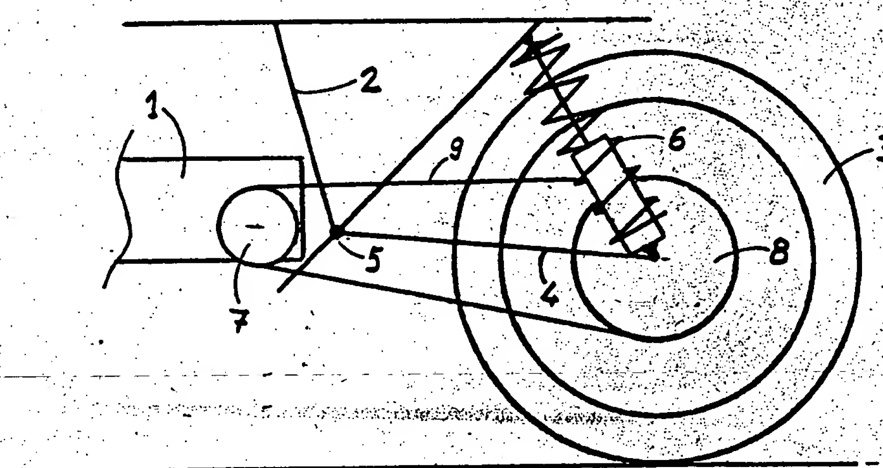

Fig. 1

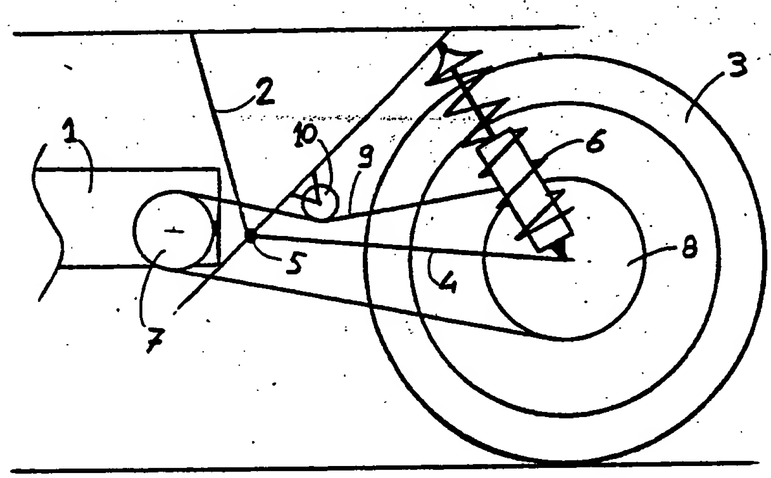

Fig. 2

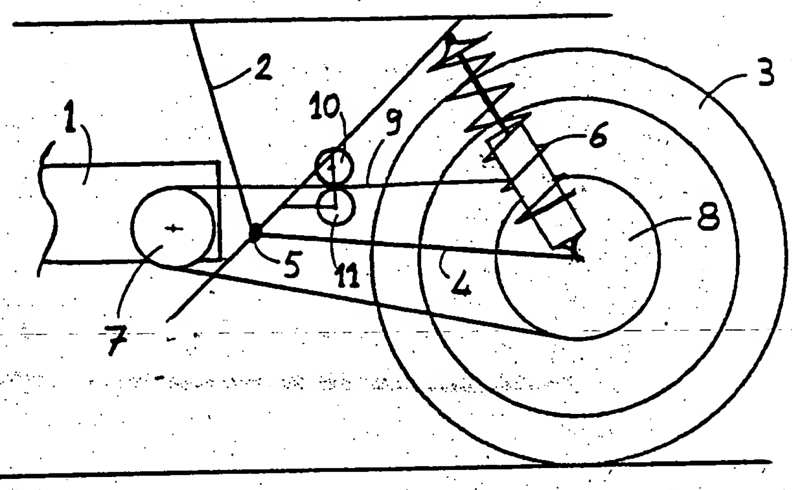

Fig. 3

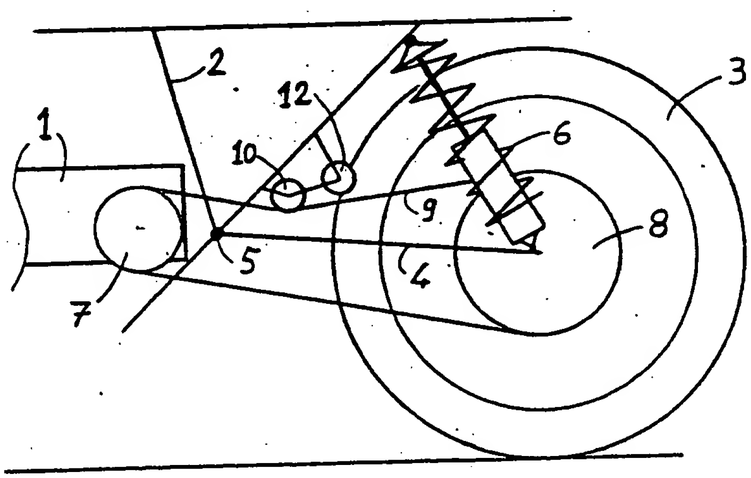

Fig. 4

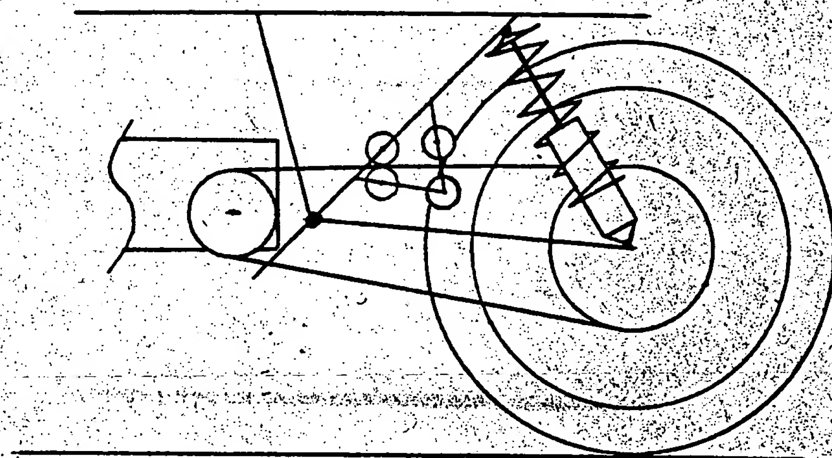

Fig. 5